FURTHER OBSERVATIONS ON THE RELATION OF LESIONS OF THE GASSERIAN AND POSTERIOR ROOT GANGLIA TO HERPES OCCURRING IN PNEUMONIA AND CEREBROSPINAL MENINGITIS.[1]

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Introduction. At the meeting of the Association in 1902 I reported two cases of herpes, one of the lip and nose and the other of the trunk, occurring in acute croupous pneumonia, in both of which the sensory ganglia supplying the areas affected with herpes showed acute degenerative and exudative changes.

At this time I suggested that careful examination would disclose similar lesions in the sensory ganglia supplying areas affected with herpes, complicating other infectious diseases, especially cerebrospinal meningitis, typhoid fever, and malaria.

Since then I have had opportunity to examine at autopsy two cases of cerebrospinal meningitis and one case of pneumonia with herpes. In all three cases definite lesions were found in the sensory ganglia supplying the herpetic areas.

In addition, I have seen in the wards of the Lakeside Hospital, in the service of my colleague, Dr. John H. Lowman, two unusual examples of facial herpes complicating non-fatal pneumonia.

Report of Cases: Herpes Complicating Pneumonia.

Case I. *Summary: Herpes of the skin of the right side of the nose, especially marked near the inner canthus of the right eye, occurring in a child with pneumonia complicating typhoid fever; degenerative and exudative changes in that portion of the right Gasserian ganglion, giving rise to the nerves supplying the skin of the upper portion of the nose; left Gasserian ganglion normal.*— T. W., male, aged four years, was admitted on March 26, 1903, to the Lakeside Hospital, service of Dr. John H. Lowman, after an illness of thirteen days. He was drowsy and apathetic and breathed rapidly. Physical examination showed signs of consolidation of the upper lobe of the right lung. The spleen was enlarged. Widal reaction positive. There was a well-marked crop of herpes near the inner canthus of the right eye. On the morning of March 31st sloughing of the right cornea was recorded. Death occurred at 11.45 P.M., March 31, 1903.

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[1] Read by title at the Twentieth Annual Meeting of the Association of American Physicians, Washington, D. C., May 17, 1905.

Clinical Diagnosis. Typhoid fever, acute croupous pneumonia of the right lung, herpes of the right side of the nose, sloughing of the right cornea.

Anatomical Diagnosis. Typhoid fever (ileotyphus), hyperplasia of the mesenteric lymph nodes and the spleen, acute croupous pneumonia of the right lung (all three lobes), acute serofibrinous pleurisy, emphysema of the left lung, focal necrosis of the liver, cloudy swelling of the heart, liver, and kidneys. Herpes of the right side of the nose, sloughing of the right cornea, congestion, hemorrhage and acute degenerative and interstitial inflammation of the right Gasserian ganglion.

Bacillus typhosus was isolated from the spleen and gall-bladder, and staphylococcus pyogenes aureus from the lungs, heart blood, and liver.

The autopsy was begun ten hours after death. The detailed description of the autopsy findings will be omitted. The Gasserian ganglia were of ordinary size. The veins about both were congested. The capsules and nerves of both were free from signs of inflammatory exudation. There was no meningitis.

Histological Examination of the Gasserian Ganglion and the Fifth Nerve. Right Gasserian Ganglion: There was marked congestion of the veins along the convex border of the ganglion. Here, corresponding to a portion of the origin of the superior maxillary muscle of the fifth nerve, there was an area showing marked degeneration of the ganglion cells and infiltration of the interstitial tissue with leukocytes. The fifth nerve and its branches showed no degenerative or inflammatory changes. The *left Gasserian ganglion* and fifth nerve were normal.

CASE II. *Summary: Herpes of the right upper and lower lips, the right upper and lower eyelids, and the right side of the neck*—i. e., *of the regions supplied by the right Gasserian and the right third cervical ganglia, occurring during an attack of acute croupous pneumonia, ending in recovery.*—Mrs. H. C., aged fifty-eight years, was admitted to the Lakeside Hospital, service of Dr. J. H. Lowman, on May 7, 1904, with the physical signs of acute croupous pneumonia of the lower lobe of the right lung, which later involved the entire lung. She was taken ill on May 3d, with a chill and pain in the right side of the chest. On admission there was an extensive crop of herpes involving both the upper and lower lips (most marked on the right side) and the right upper and lower lids of the right eye. There was conjunctivitis with granular lids on this side.

On the sixth day of her illness a crop of herpes appeared on the right side of the neck two inches below the angle of the jaw.

The patient recovered, so there was no opportunity to examine the sensory ganglia. The herpes ran the usual course of the so-called herpes zoster. In the light of our previous cases and of those of meningitis reported below, it is evident that the patient had extensive lesions of the right Gasserian and of the right third cervical posterior root ganglia.

CASE III. *Summary: Herpes of the left lower eyelid occurring in the course of acute croupous pneumonia.*—In this man, also in the service of Dr. J. H. Lowman, there was herpes orbicularis occurring in a typical attack of acute croupous pneumonia, ending in recovery.

Herpes Complicating Cerebrospinal Meningitis.

CASE IV. *Summary: Epidemic cerebrospinal meningitis, with herpes of the right side of the face and neck, and of the left upper lip, and the vestibule of the nose and of the head and soft palate, regions supplied by both Gasserian and the third right cervical posterior root ganglia.*—D. L., male, aged twenty years, entered the Lakeside Hospital, service of Dr. H. H. Powell, October 27, 1904, complaining of severe pain in the head and the right side of the body. He had always been well until October 20th, when he was taken ill with chilly sensations and pain in the head and body.

Four days later he suffered severe burning pain in the right side of the neck. Later at this point a rash developed, followed by a large crop of herpetic vesicles. On admission there was marked rigidity of the neck, hyperæsthesia, and marked herpes, involving a large area on the right side of the neck below the angle of the jaw. Herpes later developed on the right cheek, near the ear. Kernig's sign was present. The diplococcus intracellularis meningitidis was isolated from fluid removed at lumbar puncture. Death occurred November 11, 1904.

Clinical Diagnosis. Epidemic cerebrospinal meningitis with facial and cervical herpes.

Autopsy. The autopsy was begun one hour after death.

The following is abstracted from the autopsy protocol: The body is that of a white male, 167 cm. long. There are extensive herpetic eruptions involving the right cheek just in front of the ear, the right side of the neck, the left upper lip and vestibule of the left nostril and the mucous membrane of the hard and soft palate on both sides. The eruption of the lip and nose is in the vesicular stage. That on the face and neck is covered with dry crusts. In the mouth the eruption is macular and pustular.

Nervous System. The dura and pia arachnoid are congested. Over the surfaces of the medulla and pons there is a thick fibrinopurulent exudate of gelatinous consistency. At the base of the brain and in the lateral ventricles there is a considerable amount of turbid fluid. The nerves at the base of the brain are enveloped in the exudate.

Gasserian Ganglia. Both are surrounded by a thick purulent exudate. The bloodvessels are congested.

Spinal Cord. The membranes of the cord are bathed in a turbid fluid. The pia arachnoid is covered with a fibrinopurulent exudate, which extends to many of the nerve roots. The cord on section shows no appreciable changes. The third right cervical ganglion is larger than its fellows of the opposite side.

The other organs show no changes of present interest and their description is, therefore, omitted. The diplococcus intracellularis meningitidis was isolated in pure culture from the cerebrospinal exudate.

Microscopic Examination of Nervous System. The central part of the convex border of the ganglion—*i. e.*, that portion corresponding to the origin of the superior maxillary branch and possibly a portion of the inferior maxillary branch is the seat of extensive degeneration and destruction of ganglion cells, with leukocytic infiltration.

The affected ganglion cells are cloudy, stain poorly and are often hyaline. Some cells are swollen and others are shrunken. In those less affected the nuclei show no changes. In markedly degenerated cells the nuclei may be eccentric and some stain diffusely. The leukocytic infiltration is most marked in the interstitial tissue, but some ganglion cell spaces contain leukocytes. The plexus of nerve fibres coming from this portion of the ganglion are surrounded with a fibrinopurulent exudate. Sections of the sensory root of the fifth nerve show no recognizable changes, when stained in either methylene blue and eosin or by Weigert's myelin sheath method.

Left Gasserian Ganglion and Fifth Nerve. In this ganglion similar changes are present and in the same portion of the ganglion as described in the right. The sensory root of the fifth nerve shows small scattered areas of cellular infiltration.

The Third Right and Left Cervical Ganglion and Posterior Root Nerves. The right ganglion is the seat of numerous small areas of ganglion cell degeneration and of interstitial and periganglion cell cellular infiltration. The changes are best marked at the distal end and at one side of the ganglion. The right posterior root is surrounded and infiltrated by large numbers of leukocytes. The left posterior root is similarly but less intensely affected. The left ganglion is normal.

Sections of the cord made at various levels show marked meningitis. The other ganglia are free from changes.

Anatomical Diagnosis. Acute epidemic cerebrospinal meningitis, due to diplococcus intracellularis meningitidis. Degenerative and exudative changes in both Gasserian and in the third right Gasserian ganglia, herpes of the hard and soft palate, the left upper lip, the vestibule of the nose, the right cheek and the right side of the neck.

In regard to the lesions in the third right cervical ganglion, it is clear that the infection made its way along the posterior nerve roots. In the case of the Gasserian ganglia the route of the infection is not so clear, but it is evident that the inflammatory process is more marked in the nerve bundles about the ganglion than in the latter structure itself. It is to be noted that the distribution of the herpetic lesions corresponds exactly with the ganglionic lesions.

CASE V. *Summary: Trifacial neuralgia of the right side, suppuration of the sphenoidal sinuses; brain abscess and acute cerebrospinal meningitis, due to an actinomyces; herpes of the posterior and lateral cervical regions of the side.*—E. W., coachman, aged forty-six years, was admitted on February 11, 1905, to the Lakeside Hospital, service of Dr. J. H. Lowman, complaining of severe trifacial neuralgia of the right side. He denied having had any previous illness, except whooping-cough in childhood. He stated that he had been in good health until two weeks before admission, when his illness began with severe headache and backache. There was a slight chill, but no cough or other symptoms of disease of the respiratory tract. Ten days before admission he developed some pain, paroxysmal in character, and tenderness on pressure of the right side of the face and head. Remedies applied in the hospital relieved this pain.

On February 13th, two days after admission, he developed symptoms pointing to brain abscess on the right side and to cerebrospinal meningitis. At lumbar puncture 70 c.c. of turbid fluid were obtained. From the fluid Dr. Louis W. Ladd isolated an actinomyces, which will be described in a future paper.

At this time there appeared well-marked herpes of the skin over the capital portion of the trapezius muscle and the angle of the scapula on the left side. There was no herpes elsewhere. Death occurred February 17, 1905.

Clinical Diagnosis. Abscess of the right side of the brain, cerebrospinal meningitis due to an actinomyces. Herpes of the neck.

Autopsy. The autopsy was begun a few hours after death. As this case will be reported in full in another paper, the present descriptions of the pathological findings will be restricted to the lesions of the right fifth nerve and Gasserian ganglion and the third and fourth cervical ganglia and their roots.

Abstract of the Autopsy Protocol. The right Gasserian ganglion is of ordinary size. The sensory nerve of the fifth nerve is swollen and is marked by dark-red streaks. The veins about the ganglia were markedly dilated.

Histological Examination. Some of the veins of the capsule of the ganglion are found to be congested, but there is no hemorrhage. The ganglion cells stain normally, are not shrunken or invaded by cells. There is no infiltration of the interstitial tissue. In sections of the root of the fifth nerve stained with eosin and methylene blue, marked inflammatory lesions are found. The small veins and capillaries are congested and widely dilated. There are numerous areas of hemorrhage, which distort the nerve tissue. In many sections there are large accumulations of red blood corpuscles, leukocytes, and large oval cells about the dilated bloodvessels. The large cells, which are most numerous are evidently proliferated connective-tissue cells. In sections stained by Weigert's myelin sheath method, there is marked breaking up and even disappearance of myelin sheaths about many of the fibres about the areas of hemorrhage and inflammation. The left Gasserian ganglion and fifth nerve show no pathological changes.

Third Cervical Ganglia and Posterior Roots. The left ganglion is larger than its fellow of the opposite side. Histologically, the changes are marked. They consist in degenerated and necrotic changes in ganglion cells and in proliferative and exudative changes in the interstitial tissue. The changes are confined largely to the proximal end and to one side of the ganglion. In the affected areas the capillaries and small veins are dilated, and here and there small areas of hemorrhage are seen. The degenerative changes of the ganglion cells vary from swelling and cloudiness, with failure of the granules to stain, to hyaline change and complete necrosis. Some cells show larger and smaller vacuoles. The necrotic cells are shrunken, and their nuclei do not stain. The nuclei of some of the degenerated cells stain diffusely. There is proliferation of the cells of the spaces about the ganglion cells. The latter are not, however, invaded by cells. The right ganglion is normal.

Posterior Nerve Root. Left. The inflammatory changes here are extreme. The nerve is surrounded by a thick fibrinopurulent exudate, and in many places there are larger and smaller areas of purulent exudation in the nerve itself. This is associated with both hemorrhages and proliferation of nerve cells. Similar but less intense changes are found in the right posterior root.

The Fourth Cervical Ganglia and Nerve Root. The left ganglia and its root show the same marked degenerated and inflammatory changes described in the third left. The right ganglia is normal, but its root shows marked perineuritis and endoneuritis. The other ganglia are normal.

Spinal Cord and Meninges. Sections of the cord and meninges cut at various levels show meningeal inflammation in varying degree. They are most marked at the level of the third and fourth cervical ganglia. Here the pia arachnoid is the seat of a marked fibrinopurulent exudation, which extends along the nerve roots on both sides. The polymorphonuclear neutrophilic leukocyte is the most common cell in the exudate, but large and small mononuclear leukocytes are also present. There are also numbers of large cells with single oval nuclei. A few long, thread-like organisms are found.

The cord shows no inflammatory changes, and its ganglion cells appear normal.

Anatomical Diagnosis. Actinomycotic abscess of the right occipital lobe rupturing into the right lateral ventricle. Suppurative inflammation of the sphenoidal sinuses, acute seropurulent cerebrospinal meningitis. Acute neuritis of the fifth nerve and of the third and fourth and other posterior nerve roots. Acute inflammation of the third and fourth posterior root ganglia of the left side; herpes of the left side of the back of the neck and of the left scapular region. Slight actinomycotic bronchopneumonia.

SUMMARY. A review of these cases shows a complete correspondence between the situation of the herpetic lesions and the ganglionic changes. In each case the distribution of the herpes was limited to areas of skin or mucous membrane supplied by the ganglia, which were the seat of the degenerative inflammatory lesions. In those cases with herpes of areas supplied by nerves from the Gasserian ganglion this relation is even more precise. In Case I., for instance, with herpes on the nose near the inner canthus of the eye, the ganglionic lesion was limited to the point of origin of the superior maxillary nerve. In Case IV., with multiple herpetic lesions of the head (nose, upper lip, cheek, hard and soft palate), the lesions of the Gasserian ganglia again corresponded completely to the portion giving origin to the nerves supplying these parts. In Cases II. and III., though unsupported by anatomical examination, in view of the findings in the other cases, the inference that the herpes was associated with lesions of the Gasserian ganglia seems justified.

Case V. is of particular interest, for it demonstrates that, just as in spinal meningitis with involvement of the nerve roots, herpes does not occur unless the inflammatory changes extend to the ganglia; so in marked neuritis of the sensory root of the right fifth nerve, without appreciable changes in the Gasserian ganglion, herpes of the part supplied by this ganglion does not occur. In this case, under these conditions, there was severe trifacial neuralgia without herpes. Degenerative changes, with or without inflammatory lesions of the sensory ganglia, are therefore necessary for the excitation of the nervous impulses upon which the production of the herpetic lesions depend.

Cases IV. and V. also confirm the opinion expressed in my previous paper that the herpes of cerebrospinal meningitis is due to inflammatory lesions of the sensory ganglia.

The cases reported in this article furnish additional proof to support the position that the ordinary herpes zoster, as well as the herpes of pneumonia and cerebrospinal meningitis, is a pathological condition dependent upon definite lesions of certain sensory ganglia, which may be caused by a variety of agents acting in different ways. The herpes is dependent upon the ganglionic lesions, and apparently does not vary with causes of the latter, whether they are due to embolism, thrombosis, hemorrhage, invasion by tumors, microorganisms and other toxins or to other poisons. The ganglionic changes in the cases of herpes complicating pneumonia and cerebrospinal meningitis studied by me are identical with those described by Head and Campbell in their acute cases of so-called spontaneous herpes zoster. In the herpes of meningitis the ganglion changes are probably commonly due, as pointed out by Councilman, Mallory, and Wright, to an extension of the inflammatory process along the nerve roots to the ganglia. In pneumonia the matrices morbi are apparently brought to the ganglia by the circulation.

REFERENCES.

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A CASE OF SYRINGOMYELIA WITH DOUBLE OPTIC NEURITIS.

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OPTIC neuritis as a complication of syringomyelia is of such unusual occurrence that a report of such a condition even without necropsy should be of interest.

We have been able to find only two similar cases in the literature, one by Bullard and Thomas, reported in this JOURNAL in 1899, and the other by Saxer.[1] Although neither of these instances were diagnosed during life, their clinical histories to a large extent resembles ours. A brief *résumé* of these cases is of interest.

Boy, aged six and one-half years. His family and the past history of the patient were unimportant. At three years of age severe headache and a little later vomiting appeared. These symptoms gradually increased in severity and a year after they began marked double optic neuritis developed, this being followed by optic atrophy. Ten months after the blindness began, a sudden paralysis of the lower limbs appeared, followed by anæsthesia and flexor contractures in the lower limbs and disturbances in the function of the bladder and rectum. The headache, blindness, and the vomiting persisted

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[1] Beiträg. z. path. Anat. u. z. allgem. Path., Bd. xx. No. 2.